



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/386,847	08/31/1999	SHIGEKI WATANABE	837.1209/JDH	1867
21171	7590	02/11/2005	EXAMINER	
STAAS & HALSEY LLP SUITE 700 1201 NEW YORK AVENUE, N.W. WASHINGTON, DC 20005			MOONEY, MICHAEL P	
			ART UNIT	PAPER NUMBER
			2883	

DATE MAILED: 02/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

<b>Office Action Summary</b>	<b>Application No.</b> 09/386,847	<b>Applicant(s)</b> WATANABE, SHIGEKI	
	<b>Examiner</b> Michael P. Mooney	<b>Art Unit</b> 2883	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-19, 21-26 and 34-41 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-19, 21-26, 34 and 36-41 is/are allowed.
- 6) ☒ Claim(s) 35 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Miyata et al. (6366376).**

Miyata et al. teaches 1<sup>st</sup> and 2<sup>nd</sup> optical fiber (OF) networks each adapted to wavelength division multiplexing (WDM) (fig. 1); and a converter 26 connected between said 1<sup>st</sup> and 2<sup>nd</sup> OF networks, said converter 26 converting optical signal light (SL) by nonlinear optical effect based on said SL and pump light, wherein said SL is WDM SL obtained by wavelength division multiplexing a plurality of optical signals having different wavelengths and arranged at unequal intervals. (fig. 6; col. 20 lines 28-56; fig.

1).

Art Unit: 2883

It is noted that although Miyata et al. does not explicitly state a nonlinear optical effect for amplifiers 26, it is well known that such amplifiers convert signals via a nonlinear optical effect.

Thus claim 35 is rejected.

***Allowable Subject Matter***

Claims 1-19, 21-26, 34, 36-41 are allowed.

The following is an examiner's statement of reasons for allowance:

The prior art, either alone or in combination, does not disclose or render obvious a device comprising: an optical circulator having first, second, and third ports; a polarization beam splitter having fourth, fifth and sixth ports, said fourth port being connected to said second port; a polarization maintaining fiber having first and second ends, and having a polarization mode to be maintained between said first and second ends, said fifth end being optically connected to said fifth port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said sixth port so that said second polarization plane is adapted to said polarization mode in combination with the rest of claim 1.

It is noted that the claim 1 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a device comprising: a polarization beam splitter having first, second and third ports, said first port being supplied with signal light including first and second polarization components respectively having first and second polarization planes orthogonal to each other, said fifth end being optically connected to said fifth port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said sixth port so that said second polarization plane is adapted to said polarization mode in combination with the rest of claim 1.

Art Unit: 2883

other, and with pump light said first and second ports being coupled by said first polarization plane (1<sup>st</sup> PP), said first and third ports being coupled by said second polarization plane (2<sup>nd</sup> PP); and

a polarization maintaining fiber (PMF) having first and second ends, and having a polarization mode to be maintained between said first and second ends, said first end being optically connected to said second port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said third port so that said second polarization plane is adapted to said polarization mode; wherein said polarization mode to be maintained by said PMF is given by a predetermined principal axis (PPA); said 1<sup>st</sup> PP of said signal light in said second port includes said PPA; and said 2<sup>nd</sup> PP of said signal light in said 3<sup>rd</sup> port includes said PPA in combination with the rest of claim 11 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 11 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a device comprising: a polarization beam splitter (PBS) having first, second and third ports, said first port being supplied with signal light including first and second polarization components respectively having first and second polarization planes orthogonal to each other, and with pump light said first and second ports being coupled

Art Unit: 2883

by said first polarization plane (1<sup>st</sup> PP), said first and third ports being coupled by said second polarization plane (2<sup>nd</sup> PP); and

a polarization maintaining fiber (PMF) having first and second ends, and having a polarization mode to be maintained between said first and second ends, said first end being optically connected to said second port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said third port so that said second polarization plane is adapted to said polarization mode; and

an optical circulator optically connected to said 1<sup>st</sup> port and said PBS in combination with the rest of claim 12 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 12 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a device comprising: a polarization beam splitter (PBS) having first, second and third ports, said first port being supplied with signal light including first and second polarization components respectively having first and second polarization planes orthogonal to each other, and with pump light said first and second ports being coupled by said first polarization plane (1<sup>st</sup> PP), said first and third ports being coupled by said second polarization plane (2<sup>nd</sup> PP); and

Art Unit: 2883

a polarization maintaining fiber (PMF) having first and second ends, and having a polarization mode to be maintained between said first and second ends, said first end being optically connected to said second port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said third port so that said second polarization plane is adapted to said polarization mode; and wherein said PMF has a substantially constant zero-dispersion wavelength (ZDW) in relation to said polarization mode, and said pump light has a wavelength substantially equal to said ZDW in combination with the rest of claim 13 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 13 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: first and second optical fiber networks each adapted to wavelength division multiplexing; and a converter connected between said first and second optical fiber networks, said converter converting signal light into converted signal light by nonlinear optical effect based on said signal light and pump light, wherein said converter comprises: a pumping source for outputting pump light; an optical circulator having first, second, and third ports, said first port being supplied with signal light including first and second polarization components respectively having first and second polarization planes orthogonal to each other, and with said pump light; a polarization beam splitter having fourth, fifth, and sixth ports, said fourth port being

Art Unit: 2883

optically connected to said second port, said fourth and fifth ports being coupled by said first polarization plane, said fourth and sixth ports being coupled by said second polarization plane; and a polarization maintaining fiber having first and second ends, and having a polarization mode to be maintained between said first and second ends, said first end being optically connected to said fifth port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said sixth port so that said second polarization plane is adapted to said polarization mode in combination with the rest of claim 14.

It is noted that the claim 14 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: the signal light being converted into converted signal light by nonlinear optical effect (NLO) based on said signal light and pump light in said polarization maintaining optical fiber; wherein said polarization mode to be maintained by said polarization maintaining fiber (PMF) is given by a predetermined principal axis (PPA); said 1<sup>st</sup> polarization plane (PP) of said signal light in said 2<sup>nd</sup> port includes said PPA; and said 2<sup>nd</sup> PP of said signal light in said 3<sup>rd</sup> port includes said PPA in combination with the rest of claim 34 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 34 is allowable because the unique combination of each and every specific element stated in the claim.



Art Unit: 2883

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: a converter connected between said first and second optical fiber networks, said converter converting signal light into said converted signal light by nonlinear optical effect based on said signal light and pump light; wherein when each of said first and second fiber spans is virtually divided into the same number of a plurality of sections, the product of the average of chromatic dispersions of a first one of said plurality of said sections of said first fiber span and the length of said first one is substantially equal to the product of the average of chromatic dispersions of a second one of said plurality of said sections of said second fiber span and the length of said second one, said first and second ones corresponding to each other in order as counted according to distance from said converter, and the product of the average of optical powers in said first one, the average of nonlinear coefficients in said first one, and the length of said first one is substantially equal to the product of the average of optical powers in said second one, the average of nonlinear coefficients in said second one, and the length of said second one in combination with the rest of claim 36 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 36 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: when each of said first and second fiber spans is virtually divided into the same number of a plurality of sections, the ratio of the product of an average of powers in said first one, the average of nonlinear coefficients in said first one, and the length of said first one to the product of the average of optical powers in said second one, the average of nonlinear coefficients in said second one, and the length of said second one in combination with the rest of claim 36 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

Art Unit: 2883

an optical power and a nonlinear coefficient to a chromatic dispersion at a first one of said plurality of said sections of said first fiber span is substantially equal to the ratio of the product of an average of the optical power and an average of a nonlinear coefficient to a chromatic dispersion at a in a second one of said plurality of said sections of said second fiber span; an accumulated value of chromatic dispersions measured from said converter to said first point on said first one being equal to an accumulated value of chromatic dispersions measured from said converter to said second point on said second one; and said first and second ones corresponding to each other in order as counted according to distance from said converter in combination with the rest of claim 37 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 37 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: when each of said first and second fiber spans is virtually divided into the same number of a plurality of sections; the ratio of the product of an optical power and a nonlinear coefficient to a chromatic dispersion at a first point on a first one of said plurality of said sections of said first fiber span is substantially equal to the ratio of the product of an optical power and a nonlinear coefficient to a chromatic dispersion at a second point on a second one of said plurality of said sections of said second fiber span; an accumulated value of the products of optical powers and nonlinear coefficients measured from said converter to said first point being equal to an accumulated value of the products of optical powers and nonlinear coefficients measured from said converter

Art Unit: 2883

to said second point on said second one; and said first and second ones corresponding to each other in order as counted according to distance from said converter in combination with the rest of claim 38 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 38 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: a converter connected between said first and second optical fiber networks, said converter converting signal light into converted signal light by nonlinear optical effect based on said signal light and pump light; wherein when each of said first and second fiber spans is virtually divided into the same number of a plurality of sections, the product of the average of chromatic dispersions of a second one of said plurality of said sections of and the length of said second one; and said first and second ones corresponding to each other in order as counted according to distance from said converter in combination with the rest of claim 39 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 39 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a system comprising: wherein when each of said first and second fiber spans is virtually divided into the same number of a plurality of sections, the product of the average of optical powers in a first one of said plurality of said first fiber span, the average of plurality of said sections of and the length of said first one; and said first and second ones corresponding to each other in order as counted according to distance from said converter in combination with the rest of claim 38 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

Art Unit: 2883

nonlinear coefficients in said first one, and the length of said first one is substantially equal to the product of the average of optical powers in a second one of said plurality of said sections of said second fiber, the average of nonlinear coefficients in said second one, and the length of said second one; and said first and second ones corresponding to each other in order as counted according to distance from said converter in combination with the rest of claim 40 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

It is noted that the claim 40 is allowable because the unique combination of each and every specific element stated in the claim.

The prior art, either alone or in combination, does not disclose or render obvious a device comprising: a polarization maintaining fiber having first and second ends, and having a polarization mode to be maintained between said first and second ends, said first end being optically connected to said second port so that said first polarization plane is adapted to said polarization mode, said second end being optically connected to said third port so that said second polarization plane is adapted to said polarization mode; and wherein signal light having said first polarization plane inputted to said first port is outputted from said first and second end, the second light outputted from said second end is outputted from said first port through said polarization beam splitter, signal light having said second polarization plane inputted to said first port is outputted from said first end, and the signal light outputted from said first end is outputted from said first port through said polarization beam splitter in combination with the rest of claim 41 for the reasons stated by Applicant in the Remarks section filed 11/17/04.

First end being optically connected to said second port so that said first polarization plane is adapted to said polarization mode.

Second end being optically connected to said third port so that said second polarization plane is adapted to said polarization mode.

Signal light having said first polarization plane inputted to said first port is outputted from said first and second end.

Art Unit: 2883


It is noted that the claim 41 is allowable because the unique combination of each and every specific element stated in the claim.

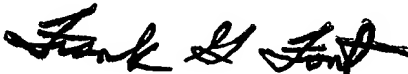
**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael P. Mooney whose telephone number is 571-272-2422. The examiner can normally be reached during weekdays, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on 571-272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-1562.

  
Michael P. Mooney  
Examiner  
Art Unit 2883

  
Frank G. Font  
Supervisory Patent Examiner  
Art Unit 2883

FGF/mpm  
2/7/05